

REMARKS

Claims 2-4, 7-10, and 13-19 are present in this Application. Claims 2, 3, 7, 15, and 16 are independent claims.

In view of the above amendment, applicant believes the pending application is in condition for allowance.

§ 103(a) Rejection – Fukumoto, Harris, Lee

Claims 2, 7-10, 13-15, 17, 18, and 19 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over JP 07-244267 (Fukumoto) in view of U.S. Patent 5,115,228 (Harris) and U.S. Patent 4,975,691 (Lee).

Claims 2, 7, 15

With respect to claim 2, the Office Action alleges that Fukumoto discloses a display apparatus comprising a display panel (1), a pair of liquid crystal shutter means (3, 4), display control means (Fig. 3), and liquid crystal shutter control means (7). The Office Action admits that Fukumoto does not teach a display control means which displays a first image one side in one frame and a second image on the other side in the next frame, or a liquid crystal shutter control means which opens and closes the pair of shutters for each frame. The Office Action instead relies on Harris for teaching a display control means and liquid crystal shutter control means. However, the Office Action admits that Fukumoto and Harris do not teach the display control means comprising a scan inverting circuit. The Office Action instead relies on Lee for disclosing a scan inverting circuit.

In particular, the Office Action states that Lee discloses display control means (130, 140, 150, 160, 170) comprising a scan inverting circuit (140) for inverting the direction of horizontal scan on the display panel in each frame or each field (Col. 3, line 67 – Col. 4, line 9). (Office Action at page 4). This same argument was presented for independent claim 7 (Office Action at page 7) and independent claim 15 (Office Action at page 14).

Applicant disagrees and submits that Lee fails to disclose the claimed “display control means” and in particular “scan inverting circuit” as recited in claims 2, 7, and 15.

Applicant submits that one of ordinary skill in the art in the display art would understand that the direction of horizontal scan is either left-to-right, or right-to-left along a row (see original specification at page 10, the full paragraph beginning on line 15, lines 18-21). Applicant submits that each of the cited references disclose only one direction for horizontal scan, produced for each row by a scan driving circuit. Lee, for example, discloses an improved horizontal scan sequencer to control conventional drivers that takes advantage of the time between horizontal scans of the display panel 110 to precondition the row drivers 122 to access a selected row during the next horizontal scan time (col. 26, lines 19-27). In other words, for a selected row Lee teaches a conventional horizontal scan signal. A modification discussed in Lee is that selection of rows is in a downward direction during odd frames and is in an upward during even frames (col. 24, lines 25-27; col. 25, lines 58-61). An advantage of Lee's modification is that the average dc voltage across the pixel cell during two frames will be substantially equal to zero volts (col. 24, lines 59-65).

However, Applicant submits that Lee does not disclose the claimed scan inversion circuit that inverts the direction of a horizontal scan, as required in claims 2, 7, and 15. In order to explicitly define what is meant by "direction of horizontal scan," the claims have been amended to recite "direction of horizontal scan along a row on said display panel." Applicant submits that Lee fails to disclose at least this claimed:

"said display control means comprises a scan inverting circuit for inverting the direction of a horizontal scan along a row on said display panel in each frame or each field, which display a first display from the first side of the display panel and a second display from the second side of the display panel"

Furthermore, Lee's improved horizontal scan sequencer is not for purposes of two-sided display. Rather Lee discloses a solution of latent image problems caused by residual dc voltage (Abstract; col. 24, lines 64-67). Harris teaches a separate gate signal generator 42, 44 for each respective shutter 16, 18. Consequently, the combination of Lee and Harris would likely lead to a separate row electronics drive circuit, i.e. two horizontal scan sequencers, of Lee for each shutter of Harris.

To the contrary, claims 2, 7, and 15 require that,

“said liquid crystal shutter control means controls the switching of the opening and closing of said pair of shutter means in response to an output from said scan inverting circuit.”

The present scan inverting circuit inverts the direction of horizontal scan in each frame, causing opening and closing of the pair of liquid crystal shutter means between image output direction A (display from a first side of the display panel) and image output direction B (display from a second side of the display panel). Figure 3, for example shows the relationship between the “scan inverted signal hsi,” pair of shutters, and “image output direction.” It can be seen that when “scan inverted signal hsi” is low, the pair of shutters are controlled to display from a first side of the display panel A. When the “scan inverted signal hsi,” is high, the pair of shutters are controlled to display from a first side of the display panel B. (see description of Fig. 3 on pages 9-12 of the original specification).

In addition, the display panel in a preferred embodiment comprises a plurality of display elements (such as shown in Fig. 1) arranged as a matrix in a two-dimensional plane. As many display elements as necessary are arranged to provide a display. (original specification at page 8, first paragraph). This feature is recited in claim 2, as

“a display panel with a first side and a second side, having a plurality of imaging devices which emit light from both sides and are arranged in a two-dimensional matrix, wherein the display panel provides a display that can be observed from either side;”

Applicant submits that Fukumoto, Harris, and Lee, either alone or in combination, fail to teach at least this claimed feature.

For at least these reasons, Applicant submits that Fukumoto, Harris, and Lee fail to teach or suggest the claimed invention. Applicant requests that the rejection be reconsidered and withdrawn.

§ 103(a) Rejection – Fukumoto, Harris, Lee, Kanemori, Liang

Claims 3 and 4 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Fukumoto, Harris, Lee, U.S. Patent 5,164,851 (Kanemori), and U.S. Application Publication 2003/0035198 (Liang).

With respect to claim 3, the Office Action alleges that Fukumoto discloses a display apparatus comprising a display panel (1), a pair of liquid crystal shutter means (3, 4), liquid crystal shutter control means (7), and display control means (Fig. 3). The Office Action admits that Fukumoto does not teach the display having picture elements, each including a plurality of display elements. The Office Action instead relies on Kanemori, and alleges that Kanemori discloses a display panel having a plurality of picture elements (40), each including a plurality of display elements (41, 42).

The display panel of the present invention comprises a plurality of display elements DE (such as shown in Fig. 1) having respective light transmission elements EL 3 arranged as a matrix in a two-dimensional plane. As many display elements as necessary are arranged to provide a display. (original specification at page 8, first paragraph).

This feature is recited in claim 3, as

“a display panel with a first side and a second side, having a plurality of picture elements, each picture element having a plurality of imaging devices which emit light from both sides and respective plurality of display elements arranged in a two-dimensional matrix to form a single unit, wherein display can be observed from either side of said display panel;”

Applicant submits that Fukumoto and Kanemori, either alone or in combination, fail to teach at least this claimed feature.

The Office Action admits that Fukumoto and Kanemori do not teach a liquid crystal shutter control means for displaying a regular image on both sides of the display simultaneously. The Office Action instead relies on Harris for teaching a liquid crystal shutter control means. However, the Office Action admits that Fukumoto, Kanemori and Harris do not teach the display control means comprising a scan inverting circuit. The Office Action instead relies on Lee for disclosing a scan inverting circuit.

In particular, similar to the case as in the above for claims 2, 7, and 15, the Office Action states that Lee discloses display control means (130, 140, 150, 160, 170) comprising a scan inverting circuit (140) for inverting the direction of horizontal scan on the display panel in each frame or each field (Col. 3, line 67 – Col. 4, line 9). (Office Action at page 18). Applicant disagrees with this statement.

Applicant submits that one of ordinary skill in the art in the display art would understand that the direction of horizontal scan is either left-to-right, or right-to-left from one end of a row to the other end (see original specification at page 10, the full paragraph beginning on line 15, lines 18-21). Applicant submits that each of the cited references disclose only one direction for horizontal scan, produced for each row by a scan driving circuit. Lee, for example, discloses an improved horizontal scan sequencer to control conventional drivers that takes advantage of the time between horizontal scans of the display panel 110 to precondition the row drivers 122 to access a selected row during the next horizontal scan time (col. 26, lines 19-27). In other words, for a selected row Lee teaches a conventional horizontal scan signal. A modification disclosed in Lee is that selection of rows is in a downward direction during odd frames and is in an upward during even frames (col. 24, lines 25-27; col. 25, lines 58-61). An advantage of Lee's modification is that the average dc voltage across the pixel cell during two frames will be substantially equal to zero volts (col. 24, lines 59-65).

However, Applicant submits that Lee does not disclose the claimed scan inversion circuit that inverts the direction of a horizontal scan, as required in claim 3. In order to explicitly define what is meant by "direction of horizontal scan," the claims have been amended to recite "direction of horizontal scan along a row on said display panel." Applicant submits that Lee fails to disclose at least the claimed feature of:

"display control means comprising a scan inverting circuit for inverting the direction of a horizontal scan along a row on said display panel in each picture element field for each horizontal scan period;"

The Office Action admits that Fukumoto, Kanemori, Harris, and Lee do not disclose shutters being able to open and close for a single picture element (Office Action at page 19).

Instead, the Office Action relies on Liang. In particular, the Office Action states that Liang discloses an electrophoretic display using an overlaid liquid crystal shutter to switch each pixel to a black color (paras. 0011-0012).

Applicant agrees that Liang discloses an electrophoretic display device, and that Liang discloses that a deficiency in an electrophoretic display device can be remedied by an overlaid shutter device to switch each pixel to black color. However, Applicant disagrees that Liang teaches, within the context of a display panel having a display that can be observed from either side, an overlaid shutter device for each pixel that are operated in response to an output from a scan inverting circuit, as required in claim 3.

Instead, Liang discloses that a problem with multi-color displays having spatially adjacent arrays of small pixels formed of microcups filled with dyes of different colors and having a top/bottom electrode switching mode, is that white light reflected from the turned-off colored pixels reduces the color saturation of the turned-on colors (para. 0011). In other words, Liang addresses a specific problem related to reflection properties in electrophoretic displays consisting of pixels formed of microcups. Liang also discloses that a solution of an overlaid shutter device to switch each pixel would have a high cost and require a complicated driving circuit design (para. 0012).

For at least these reasons, Applicant submits that Liang in combination with other cited references fails to disclose the claimed

“said liquid crystal shutter control means controls the switching of the opening and closing of said pair of liquid crystal shutter means in response to an output from said scan inverting circuit.”

Furthermore, Applicant submits that because Kanemori does not include a spatial array of small pixels formed of microcups filled with dyes of different colors, the emissive-type display device of Kanemori would not suffer from the problem of reflection properties disclosed in Liang, and thus one of ordinary skill would not be motivated by the teachings in Liang to modify Kanemori to include overlaid shutter devices to switch each pixel, which would result in high cost and require complicated driving circuit design.

The Office Action provides a motivation to combine the teachings of Liang derived from paragraph 0014, of “to improve color saturation and contrast ratio.” Applicant submits that because Liang teaches away from a solution involving overlaid shutter devices in paragraph 0012, that paragraph 0014 pertains to a solution disclosed in Liang that does not involve overlaid shutter devices. In other words, Liang’s disclosed invention does not include overlaid shutter devices such that improved color saturation and contrast ratio is not a reason to modify Kanemori with overlaid shutter devices.

At least for these reasons, Applicant submits that the rejection fails to establish *prima facie* obviousness. Applicant requests that the rejection be reconsidered and withdrawn.

§ 103(a) Rejection – Fukumoto, Harris, Lee, Liang

Claim 16 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Fukumoto, Harris, Lee, and Liang.

The arguments in the above with respect to the claimed “scan inverting circuit,” apply as well to the rejection of claim 16 (the Office Action makes a comparable statement on page 22 with respect to the teachings of the Lee reference). Also, similar to the case in the other independent claims, in order to explicitly define what is meant by “direction of horizontal scan,” the claim has been amended to recite “direction of horizontal scan along a row on said display panel.” Applicant submits that Lee fails to disclose at least the claimed feature of:

“said display control means comprises a scan inverting circuit for inverting the direction of a horizontal scan along a row on said display panel in each frame or each field;”

Furthermore, similar to the above for claim 3, Applicant submits that Liang fails to make up for the deficiency of Fukumoto, Harris, and Lee of failing to teach the claimed first shutter means and second shutter means ... that are capable of opening and closing for each display element.

Applicant requests that the rejection be reconsidered and withdrawn.

Conclusion

In view of the above remarks, it is believed that claims are allowable.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact **Robert Downs** Reg. No. 48,222 at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.14; particularly, extension of time fees.

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Respectfully submitted,

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